

EXERCISES

For more practice, see *Extra Practice*.

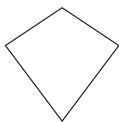
Practice and Problem Solving

A Practice by Example

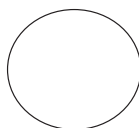
Example 1
(page 143)

Is the figure a polygon? If not, tell why.

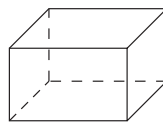
1.



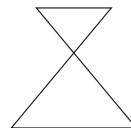
2.



3.

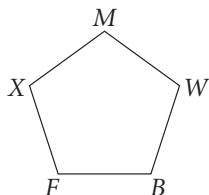


4.

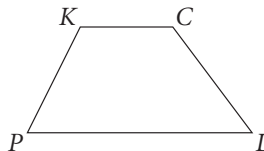


Name each polygon by its vertices. Then identify its sides and angles.

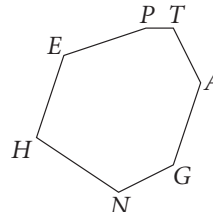
5.



6.



7.



Example 2
(page 144)

Find a polygon in each photograph. Classify the polygon by its number of sides. Tell whether the polygon is convex or concave.

8.



9.



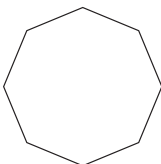
10.



Example 3
(page 145)

Find the sum of the measures of the angles of each polygon.

11.



12. dodecagon

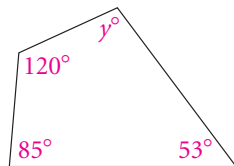
13. decagon

14. 20-gon

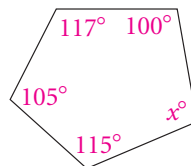
15. 1002-gon

Example 4 x^2 **Algebra** Find the missing angle measures.

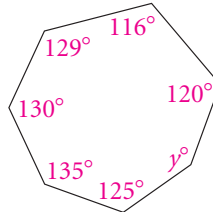
16.



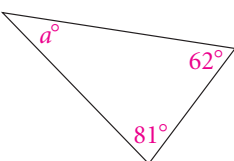
17.



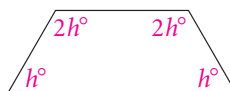
18.



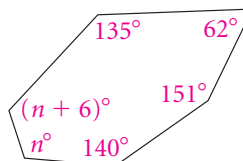
19.



20.



21.



Example 5
(page 146)

Find the measures of an interior angle and an exterior angle of each regular polygon.

22. pentagon

23. dodecagon

24. 18-gon

25. 100-gon

Packaging The nut container at the right has the shape of a regular octagon. It fits in a square box. A cheese wedge fills each corner of the box.



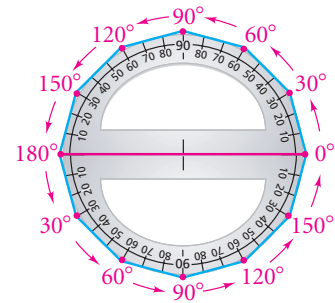
26. Find the measure of each angle of a cheese wedge.
27. **Critical Thinking** Show how to rearrange the four pieces of cheese to make a regular polygon. What is the measure of each angle of the polygon?

B Apply Your Skills

Use a protractor. Sketch each type of regular polygon.

Sample: dodecagon

Use the protractor to equally space 12 points around a circle. ($360^\circ \div 12 = 30^\circ$, so mark a point every 30° .) Connect these points to form a regular dodecagon.



28. triangle 29. quadrilateral
30. hexagon 31. octagon

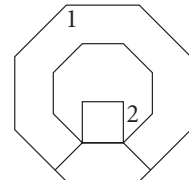
The sum of the measures of the angles of a polygon with n sides is given. Find n .

32. 180 33. 1080 34. 1980 35. 2880

36. To name each figure below, use as many of the letters A, B, C, \dots , as you need, in order, starting with A . For each figure, how many letters do you need? With this labeling, how many different ways can you name the figure?
- a. a triangle b. a quadrilateral c. a pentagon



37. **Stage Design** The diagram at the right shows platforms constructed for a theater-in-the-round stage. Describe the largest platform by the type of regular polygon it suggests. Find the measure of each numbered angle.



38. **Error Analysis** Miles said that he measured an angle of a regular polygon to be 130° . Explain why this result is impossible.
39. **Critical Thinking** A triangle has two congruent angles and an exterior angle with measure 100. Find two possible sets of measures for the angles of the triangle.

The measure of an exterior angle of a regular polygon is given. Find the measure of an interior angle, and find the number of sides.

40. 72 41. 36 42. 18 43. 30 44. x

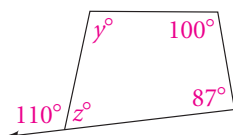
45. **Probability** Find the probability that the measure of an angle of a regular n -gon is a positive integer if n is an integer and $3 \leq n \leq 12$.



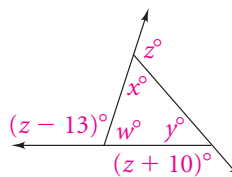
46. **Algebra** A polygon has n sides. An interior angle of the polygon and an adjacent exterior angle form a straight angle.
- a. What is the sum of the measures of the n straight angles?
- b. What is the sum of the measures of the n interior angles?
- c. Using your answers above, what is the sum of the measures of the n exterior angles?
- d. What theorem do the steps above lead to?

x^2 Algebra Find each missing angle measure. Then name the polygon.

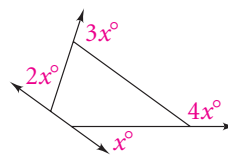
47.



48.



49.



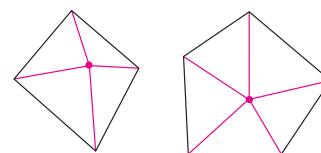
Need Help?

In Exercises 51–53, sketch a figure to meet the first condition. Then adjust it to meet the second condition.

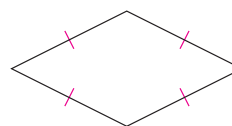
Open-Ended Sketch each figure described in Exercises 50–53.

- 50. a quadrilateral that is not equiangular
- 51. an equiangular quadrilateral that is not regular
- 52. an equilateral polygon that is not equiangular
- 53. an equiangular polygon that is not equilateral

54. **Critical Thinking** Ellen says she has another way to find the sum of the measures of the angles of a polygon. She picks a point inside the polygon, draws a segment to each vertex, counts the number of triangles, multiplies by 180, and then subtracts 360. Does her method work? Explain.



55. **Writing** Tell what you know about the figure at the right.

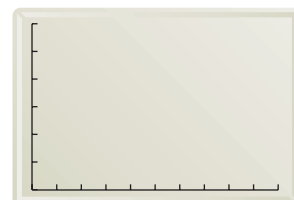


56. The measure of an interior angle of a regular polygon is three times the measure of an exterior angle of the same polygon. What is the name of the polygon?

Challenge



57. **a. Graphing Calculator** Find the measure of an angle of a regular n -gon for $n = 20, 40, 60, 80, \dots, 200$. Record your results to the nearest tenth as ordered pairs in the form $(n, \text{measure of each angle})$.
- b.** Plot the ordered pairs using a window like the one shown at the right.
- c. Data Analysis** Based on the graph from part (b), make a statement about the measure of an angle of a regular 1000-gon.
- d.** Is there a regular n -gon with an angle of 180° ? Explain.



Xmin = 0 Ymin = 160
Xmax = 200 Ymax = 184
Xscl = 20 Yscl = 4

58. **a.** Explain why the measure of an angle of a regular n -gon is given by the formulas $\frac{180(n-2)}{n}$ and $180 - \frac{360}{n}$.
- b.** Use the second formula to explain what happens to the measures in the angles of regular n -gons as n becomes a large number. Explain also what happens to the polygons.
59. Two rays bisect two consecutive angles of a regular decagon and intersect in the decagon's interior. Find the measure of the acute angles formed by the intersecting rays.

Draw, if possible, the concave quadrilateral described. If not possible, explain.

- 60. with two pairs of congruent adjacent sides
- 61. with two pairs of congruent opposite sides
- 62. with three congruent sides
- 63. with four congruent sides



Take It to the NET

Graphing Calculator procedures online at www.PHSchool.com

Web Code: afe-2120



Standardized Test Prep

Gridded Response

For Exercises 64–70, you may need the formula $(n - 2)180$ for the sum of the angle measures in a polygon with n sides.

64. What is the sum of the measures of the angles of a 25-gon?
65. A company is manufacturing a gear that has the shape of a regular polygon. The measure of each angle of the gear is 162. How many sides does the gear have?
66. The car at each vertex of a Ferris wheel holds a maximum of 5 people. The sum of the measures of the angles of the Ferris wheel is 7740. What is the maximum number of people that the Ferris wheel can hold?
67. What is the sum of the measures of the exterior angles, one at each vertex, of an octagon?
68. Exactly four angles of a hexagon are congruent. The other two angles are complementary. What is the measure of one of the four congruent angles?
69. The sum of the measures of the angles of a regular polygon is 4500. How many sides does the polygon have?
70. What is the measure of an exterior angle of a regular polygon with 36 sides?



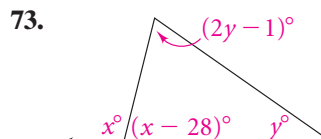
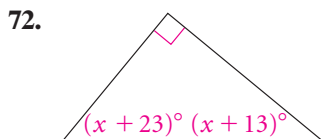
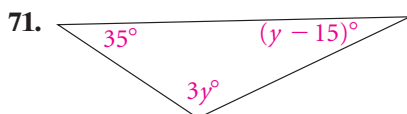
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Mixed Review

Lesson 3-3 x^2 Find each missing angle measure.



Lesson 2-4

Name the property that justifies each statement.

74. $4(2a - 3) = 8a - 12$

75. If $b + c = 7$ and $b = 2$, then $2 + c = 7$.

76. $\overline{RS} \cong \overline{RS}$

77. If $\angle 1 \cong \angle 4$, then $\angle 4 \cong \angle 1$.

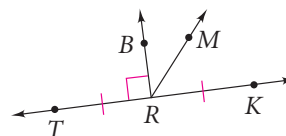
78. If $2r = 18$, then $r = 9$.

79. If $AB = BC$ and $BC = 1$, then $AB = 1$.

Lessons 1-3, 1-4

Identify the following in the diagram.

80. a pair of opposite rays
81. two right angles
82. two segments
83. an acute angle
85. a straight angle



84. an obtuse angle
86. a midpoint